Amendments to the claims:

1. (Previously canceled)

2. (Previously presented) The telemetry system of Claim 9, wherein the downhole telemetry cartridge is integrated into one of the at least one downhole tool.

3. (Previously presented) The telemetry system of Claim 9, wherein the downhole telemetry cartridge further comprises a sample clock operating at a sampling rate within the range of 300 kHz to 500 kHz.

4. (Previously presented) The telemetry system of Claim 9, wherein the downhole telemetry cartridge further comprises:

   a cable driver having power optimization logic to adjust total output power of the analog signal to a power level optimized for the wireline cable.

5. (Orginal) The telemetry system of Claim 4, wherein the cable driver operates from a voltage supply of a range of at least -15 volts and 15 volts.

6. (Original) The telemetry system of Claim 4, wherein the cable driver operates to drive the total output power to the maximum input tolerance power level of the receiver.

7. (Original) The telemetry system of Claim 6, wherein the cable driver operates to drive the total output power without consideration for cross-talk with other signals.

8. (Currently amended) A telemetry system for transmitting well-logging data from at least one downhole tool to a surface data acquisition system, the at least one down hole tool having a first tool data input/output interface, the telemetry system comprising:

a. a downhole telemetry cartridge connected to the at least one downhole tool via a second tool data input/output interface connected to the first tool data input/output interface, wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the second input/output interface and comprising:

a transmitter connected to the second tool data input/output interface, and having a logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies to an uphole telemetry unit connected to the downhole telemetry cartridge by a wireline; and

a cable driver having transmission power level control circuitry having logic to control the transmission power to optimize the total transmission power applied to the wireline cable ~~as a function of~~ in response to a received adjustment signal ~~which~~ transmitted to the downhole telemetry cartridge from the uphole telemetry unit and ~~which~~ wherein the adjustment signal is a function of cable length, cable material, cable temperature, and cable geometry;

b. wherein the uphole telemetry unit is further connected to the surface data acquisition system via an acquisition computer interface and comprising

a receiver connected to the surface data acquisition system and having logic operable to receive the analog signals on the plurality of carrier frequencies, to demodulate the received signals into a bitstream, and to output the bitstream to the acquisition computer via the acquisition computer interface; and

logic to during the course of a logging job repeatedly measure the received signal amplitude and, in response to the measure of the received signal amplitude, to transmit the ~~received~~ adjustment signal to the downhole telemetry cartridge; and

c. a wireline cable providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein the analog signals are transmitted in an uphole direction on the wireline cable.

9. (currently amended) A telemetry system for transmitting well-logging data from at least one downhole tool to a surface data acquisition system, the at least one down hole tool having a first tool data input/output interface, the telemetry system comprising:

a. a downhole telemetry cartridge connected to an uphole telemetry unit over a wireline cable that provides an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit;

b. the downhole telemetry cartridge connected to the at least one downhole tool via a second tool data input/output interface connected to the first tool data input/output interface, wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the second input/output interface and comprising:

a transmitter connected to the second tool data input/output interface, and having a logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies and having logic to perform a training sequence including transmitting a known signal on the plurality of carriers, to receive a control signal, and in response to the control signal, to adjust at least one characteristic selected from the set having the members total power, power-per-carrier and bits-per-carrier; and

c. ~~an~~ the uphole telemetry unit connected to the surface data acquisition system via an acquisition computer interface and comprising

a receiver connected to the surface data acquisition system and having logic operable to receive the analog signals on the plurality of carrier frequencies, to demodulate the received signals into a bitstream, and to output the bitstream to the acquisition computer via the acquisition computer interface; and

an uphole transmitter operable to perform a training sequence including to receive the known signal, and in response to receiving the known signal, determining an adjustment selected from the set having the members total power, power-per-carrier and bits-per-carrier, and to transmit control signals from the data acquisition system to the at least one downhole tool, wherein the control signals are transmitted simultaneously on the wireline cable in a second propagation mode that is different from the first propagation mode and at least one of the first and second propagation modes further comprises a pilot tone;

wherein the performance of the training sequence is performed repeatedly during the course of a logging job.

10. (Cancelled)

11. (Cancelled)

12. (Currently Amended) A telemetry system for transmitting well-logging data from at least one downhole tool to a surface data acquisition system, the at least one down hole tool having a first tool data input/output interface, the telemetry system comprising:

a. a downhole telemetry cartridge connected to the at least one downhole tool via a second tool data input/output interface connected to the first tool data input/output interface, wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the second input/output interface and comprising:

a transmitter connected to the second tool data input/output interface, and having a logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies; ~~and~~

a cable driver having transmission power control circuitry having logic to independently control the transmission power of each carrier frequency; and

a logic to perform a training sequence including transmitting a known signal on the plurality of carriers, to receive a control signal, and in response to the control signal, to adjust the power-per-carrier;

b. an uphole telemetry unit connected to the surface data acquisition system via an acquisition computer interface and comprising

a receiver connected to the surface data acquisition system and having logic operable to receive the analog signals on the plurality of

carrier frequencies, to demodulate the received signals into a bitstream, and to output the bitstream to the acquisition computer via the acquisition computer interface; and

to perform a training sequence including to receive the known signal, and in response to receiving the known signal, determining an adjustment to the power-per-carrier; and

c. a wireline cable providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein the analog signals are transmitted in an uphole direction on the wireline cable;

wherein the receiver further comprises logic operable to cause the transmission from the receiver to cable driver of a control signal indicative to the power level control circuitry to increase or decrease the transmission power for any carrier frequency; and

wherein the training sequence is performed repeatedly during the course of a logging-job.

13. (Previously presented) A telemetry system for transmitting well-logging data from at least one downhole tool to a surface data acquisition system, the at least one down hole tool having a first tool data input/output interface, the telemetry system comprising:

a. a downhole telemetry cartridge connected to the at least one downhole tool via a second tool data input/output interface connected to the first tool data

input/output interface, wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the second input/output interface and comprising:

a transmitter connected to the second tool data input/output interface, and having a logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies; and

a cable driver connected having transmission power level control circuitry having logic to control the total transmission power applied to the wireline cable;

b. an uphole telemetry unit connected to the surface data acquisition system via an acquisition computer interface and comprising

a receiver connected to the surface data acquisition system and having logic operable to receive the analog signals on the plurality of carrier frequencies, to demodulate the received signals into a bitstream, and to output the bitstream to the acquisition computer via the acquisition computer interface; and

c. a wireline cable providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein the analog signals are transmitted in an uphole direction on the wireline cable;

wherein the receiver further comprises logic operable to cause the transmission from the receiver to cable driver of a control signal indicative to the

transmission power level control circuitry to increase or decrease the total transmission power applied to the wireline cable.

14. (Currently Amended) A telemetry system for transmitting well-logging data from at least one downhole tool to a surface data acquisition system, the at least one down hole tool having a first tool data input/output interface, the telemetry system comprising:

a. a downhole telemetry cartridge connected to the at least one downhole tool via a second tool data input/output interface connected to the first tool data input/output interface, wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the second input/output interface and comprising:

a transmitter connected to the second tool data input/output interface, and having a logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies;

b. an uphole telemetry unit connected to the surface data acquisition system via an acquisition computer interface and comprising

a receiver connected to the surface data acquisition system and having logic operable to receive the analog signals on the plurality of carrier frequencies, to demodulate the received signals into a bitstream, and to output the bitstream to the acquisition computer via the acquisition computer interface; and

c. a wireline cable providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein the analog signals are transmitted in an uphole direction on the wireline cable;

d. a tone ordering logic operable to divide the bit stream into bit groups such that there is a one-to-one mapping between bit groups and carrier frequencies;

e. a downhole bits-per-carrier table containing a mapping between each bit group and the number of bits allocated to each carrier for each cycle of operation; ~~and~~

f. a constellation encoder connected to receive the bit groups from the tone ordering logic and the bits-per-carrier from the bits-per-carrier table, and operable to encode the bit groups as complex numbers; and

g. a training logic executed repeatedly during the course of a logging job and operable to populate the bits-per-carrier table.

15. (Cancelled)

16. (Currently Amended) The telemetry system of Claim ~~15~~ 14 wherein the training logic comprises a downhole training logic and an uphole training logic and wherein the downhole training logic comprises

logic operable to transmit a known signal on each of a plurality of carriers; and

logic operable to receive the number of bits-per-carrier from the uphole telemetry unit; and

the uphole training logic comprises

logic operable to measure the signal-to-noise ratio on the received known signals;

logic operable to determine the number of bits-per-carrier as a function of the signal-to-noise ratio; and

logic operable to cause the transmission of the number of bits-per-carrier to the downhole telemetry cartridge.

17. (Original) The telemetry system of Claim 16 wherein the downhole telemetry cartridge further comprises logic to populate the downhole bit-per-carrier table with the received number of bits-per-carrier; and

wherein the uphole telemetry unit further comprises an uphole bits-per-carrier table and a logic to populate the uphole bits-per-carrier table with the same number of bits-per-carrier.

18. (Cancelled)

19. (Cancelled)

20. (Previously presented) The telemetry system of Claim 8, wherein the downhole telemetry cartridge is constructed from components capable of operation at temperatures above 150 degrees Celsius.

21. (Currently amended) A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

executing a training sequence having the steps of:

transmitting a known signal on each of a plurality of carriers from the downhole telemetry cartridge to the uphole telemetry unit;

measuring at the uphole telemetry unit the signal-to-noise ratio on the known signal on each of the plurality of carriers;

using the signal-to-noise ratio measurement to determine the number of bits-per-constellation to use for each carrier; and

populating a bits-per-carrier table with the bits-per-constellation value for each carrier; and

dynamically adjusting the bits-per-carrier table during the course of a logging job by re-transmitting the known signal on a subset of the plurality of carriers, re-measuring at the uphole telemetry unit the signal-to-noise ratio on each of the subset of plurality of carriers, using the re-measured signal-to-noise ratio on each of the subset of plurality of carrier to determine the number of bits-per-constellation to use for each of the subset of the plurality of carriers; and populating the bits-per-carrier table entries for each of the subset of the plurality of carriers with the bits-per-constellation value for each of the subset of the plurality of carriers.

22. (Original) The method of operating a well-logging telemetry system of Claim 21, wherein the step of populating a bits-per-carrier table comprises:

populating a bits-per-carrier table in the uphole telemetry unit and populating a bits-per-carrier table in the downhole telemetry cartridge.

23. (previously presented) The method of operating a well-logging telemetry system of Claim 21, further comprising:

acquiring well-log data from a well-logging tool; and

wherein at least one of the steps of transmitting a known signal on each of a plurality of carriers, measuring the signal-to-noise ratio on the known signal on each of the plurality of carriers, using the signal-to-noise ratio measurement to determine the number of bits-per-constellation to use for each carrier, and populating a bits-per-carrier table with the bits-per-constellation value for each carrier is executed concurrently with the step of acquiring well-log data.

24. (Original) The method of operating a well-logging telemetry system of Claim 21 further comprising:

transmitting a known complex number from the downhole telemetry cartridge to the uphole telemetry unit;

receiving the transmitted complex number at the uphole telemetry unit;

dividing the received complex number by the known complex number thereby obtaining an adjustment parameter; and

using the adjustment parameter for time domain equalization.

25. (Original) The method of operating a well-logging telemetry system of Claim 21, further comprising:

transmitting a known complex number from the downhole telemetry cartridge to the uphole telemetry unit;

receiving the transmitted complex number at the uphole telemetry unit;

dividing the received complex number by the known complex number thereby obtaining an adjustment parameter; and

using the adjustment parameter for frequency domain equalization.

26. (Currently Amended) A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

during the course of a logging job, repeatedly performing a training sequence including:

transmitting a signal of known power level on each of a plurality of carriers from the downhole telemetry cartridge to the uphole telemetry unit;

measuring the signal amplitude received on each carrier;

comparing the power level received on each carrier to a predetermined maximum power level for each carrier;

based on the comparison of power level, transmitting an indication to adjust the power level on at least one of the carriers from the uphole telemetry unit to the downhole telemetry cartridge;

adjusting the power level of at least one of the carriers based on the indication received.

27. (Previously cancelled)

28. (Currently Amended) A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

modulating a bit stream onto a plurality of carrier frequencies;

transmitting the modulated bit stream on a first propagation mode from the downhole telemetry cartridge to the uphole telemetry unit;

operating the uphole telemetry unit to demodulate the received bitstream~~;~~

during the course of a logging job, repeatedly:

using a training sequence to populate a bits-per-carrier table in the downhole telemetry cartridge and a bits-per-carrier table in the uphole telemetry unit;

wherein the step of modulating the bit stream onto a plurality of carrier frequencies modulates the bit stream for each carrier according to values stored in the downhole bits-per-carrier table for such each carrier; and

wherein the step of demodulating the bit stream demodulates the bit stream from each carrier according to values stored in the uphole bits-per-carrier table.

29. (Currently Amended) A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

modulating a bit stream onto a plurality of carrier frequencies;

transmitting the modulated bit stream on a first propagation mode from the downhole telemetry cartridge to the uphole telemetry unit;

operating the uphole telemetry unit to demodulate the received bitstream;

during the course of a logging job, repeatedly:

using a training sequence to populate a downhole gain table in the downhole telemetry cartridge and an uphole gain table in the uphole telemetry unit; and

adjusting the gain on each carrier based on values stored in the downhole gain table.

30. (Previously presented) The telemetry system of Claim 8 wherein the wireline cable is a heptacable.

31. (Previously presented) The method of Claim 21, wherein the wireline cable is a heptacable.

32. (Previously presented) The method of Claim 28, wherein the wireline cable is a heptacable.

33. (Previously presented) The method of Claim 14, wherein the downhole telemetry cartridge is integrated into one of the at least one downhole tool.

34. (Previously presented) The system of Claim 14, wherein the wireline cable is a heptacable.

35. (Previously Presented) The telemetry system of Claim 14, wherein the downhole telemetry cartridge is constructed from components capable of operation at temperatures above 150 degrees Celsius.

36. (Previously presented) The method of Claim 26 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, further comprising:

for each carrier that the power level may be increased without exceeding the predetermined maximum power level for the each carrier, determining whether an increase in power level would improve the bits-per-carrier for the each carrier and whether a decrease in power level would degrade the bits-per-carrier for the each carrier;

and wherein in the transmitting step, based on both the comparison of power level and determination of improvement or degradation in bits-per-carrier for at least one of the carriers, the indication to adjust the power level on the at least one of the carriers indicates to increase the power level if an improvement in number of bits-per-carrier may be achieved by a permissible increase in power and wherein the indication to adjust the

power level on the at least one of the carriers indicates to lower the power level if there would be no degradation in the number of bits-per –carrier by lowering the power level.

37. (New) The method of Claim 21 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein:

the re-transmission of the known signal on a subset of the plurality of carriers is performed periodically.

38. (New) The method of Claim 21 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the re-transmission of the known signal on a subset of the plurality of carriers is performed in response to an observed condition.

39. (New) The method of Claim 38 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the observed condition is selected from the set including the elements deterioration of overall signal-to-noise ratio and deterioration of effective data rate.

40. (New) The telemetry system of Claim 8, wherein the transmission of the adjustment signal during the course of a logging job is performed in response to an observed condition.

41. (New) The telemetry system of Claim 40 wherein the observed condition is selected from the set including the elements deterioration of overall signal-to-noise ratio and deterioration of effective data rate.

42. (New) The telemetry system of Claim 9 wherein the training sequence is performed periodically.

43. (New) The telemetry system of Claim 9 the training sequence is performed in response to an observed condition.

44. (New) The telemetry system of Claim 43 wherein the observed condition is selected from the set including the elements deterioration of overall signal-to-noise ratio and deterioration of effective data rate.

45. (New) The method of Claim 26 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the training sequence is performed periodically.

46. (New) The method of Claim 45 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the training sequence is performed in response to an observed condition.

47. (New) The method of Claim 45 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the observed condition is selected from the set including

the elements deterioration of overall signal-to-noise ratio and deterioration of effective data rate.

48. (New) The method of Claim 28 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein:

using a training sequence to populate a bits-per-carrier table in the downhole telemetry cartridge and a bits-per-carrier table in the uphole telemetry unit is performed periodically.

49. (New) The method of Claim 26 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the using a training sequence to populate a bits-per-carrier table in the downhole telemetry cartridge and a bits-per-carrier table in the uphole telemetry unit performed in response to an observed condition.

50. (New) The method of Claim 49 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the observed condition is selected from the set including the elements deterioration of overall signal-to-noise ratio and deterioration of effective data rate.

51. (New) The method of Claim 29 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein:

using a training sequence to populate a bits-per-carrier table in the downhole telemetry cartridge and a bits-per-carrier table in the uphole telemetry unit is performed periodically.

52. (New) The method of Claim 29 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the using a training sequence to populate a bits-per-carrier table in the downhole telemetry cartridge and a bits-per-carrier table in the uphole telemetry unit performed in response to an observed condition.

53. (New) The method of Claim 52 of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, wherein the observed condition is selected from the set including the elements deterioration of overall signal-to-noise ratio and deterioration of effective data rate.